UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/006,377	12/10/2001	Kazunari Tonami	216904US2	8295

22850 7590 11/22/2006

C. IRVIN MCCLELLAND
OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.
1940 DUKE STREET
ALEXANDRIA, VA 22314

EXAMINER	
LEE, TOMMY D	

ART UNIT	PAPER NUMBER
2625	

DATE MAILED: 11/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/006,377	TONAMI ET AL.	
	Examiner	Art Unit	
	Thomas D. Lee	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 September 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-75* is/are pending in the application.

4a) Of the above claim(s) *39-64* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,17,18,20-26,36,37 and 70-75* is/are rejected.

7)☒ Claim(s) *5-16,19,27-35,38 and 65-69* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This Office action is responsive to applicant's amendment filed September 18, 2006. Claims 1-75 are pending, of which claims 39-64 have been withdrawn from consideration as being drawn to a nonelected species.

Claim Rejections - 35 USC § 102

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1, 4, 17, 20, 21, 25 and 36 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent 6,515,768 (Deschuytere et al.).

Regarding claims 1, 4 and 20, Deschuytere et al. disclose an image-processing device comprising: a quantization threshold produce unit producing a plurality of quantization threshold values corresponding to each of pixels of multivalued image data according to a dither threshold matrix (quantization thresholds obtained from Bayer matrix 342 (Fig. 3)); a random dither quantize unit quantizing said multivalued image data in multivalues by a random dither process using said quantization threshold values so as to output quantized data (resultant threshold values obtained from randomized selection of threshold values in Bayer matrix by randomization module 344; comparison with pixel value by comparator 360 to produce quantized multivalued image data (column 6, lines 2-7 and 19-26)); a resolution convert binarize unit converting said quantized data into binary image data having a resolution higher than a resolution of said multivalued image data (output memory store 320 stores quantized image data at

twice the resolution of original image data in memory store 310 (Fig. 3)), wherein said resolution convert binarize unit determines the number of dot-on pixels to be output in a plural-pixel field of said binary image data according to a value of the quantized data of a pixel being processed of said multivalued image data, the plural-pixel field corresponding to said pixel being processed, and controls the order of arranging said dot-on pixels in said plural-pixel field according to a position on said dither threshold matrix corresponding to said pixel being processed (number and position of dots determined for each pixel by comparison of threshold values, whose positions within "sub-subparcels" 240 (Fig. 2) have been randomized, with a corresponding pixel value of the original image (column 5, lines 35-48 and 60-65)); and an image-forming unit forming an image according to said binary image data (recorder 326 (Fig. 3)). The smallest four threshold values among said threshold values in said dither threshold matrix are inherently arranged at different pixel positions, since there can only be one threshold value at each position in the threshold matrix.

Regarding claims 17 and 21, Deschuytere et al. disclose an image-processing device for converting quantized data of multivalued image data into binary image data having a resolution higher than a resolution of said multivalued image data, the quantized data being obtained by quantizing said multivalued image data in multivalues by a random dither process using a plurality of quantization threshold values produced according to a dither threshold matrix, the image-processing device comprising: a dot number determine unit determining the number of dot-on pixels to be output in a plural-pixel field of said binary image data according to a value of the quantized data of a pixel

being processed of said multivalued image data, the plural-pixel field corresponding to said pixel being processed (number of dots determined for each pixel by comparison of randomized threshold values with corresponding pixel value, as mentioned above); a dot output position determine unit controlling the order of arranging said number of said dot-on pixels in said plural-pixel field according to a position on said dither threshold matrix corresponding to said pixel being processed (dot positions determined for each pixel on the basis of positions of randomized threshold values within "sub-subparcels" 240, as mentioned above); and an image-forming unit forming an image according to said binary image data (recorder 326 (Fig. 3)).

Regarding claim 25, Deschuytere et al. disclose an image-processing method comprising: a quantization-threshold-producing step of producing a plurality of quantization threshold values corresponding to each of pixels of multivalued image data according to a dither threshold matrix (quantization thresholds obtained from Bayer matrix 342 (Fig. 3)); a quantization step of quantizing said multivalued image data in multivalues by a random dither process using said quantization threshold values so as to generate quantized data (resultant threshold values obtained from randomized selection of threshold values in Bayer matrix by randomization module 344; comparison with pixel value by comparator 360 to produce quantized multivalued image data (column 6, lines 2-7 and 19-26)); and a converting step of converting said quantized data into binary image data having a resolution higher than a resolution of said multivalued image data (output memory store 320 stores quantized image data at twice the resolution of original image data in memory store 310 (Fig. 3)), wherein said

converting step includes determining the number of dot-on pixels to be output in a plural-pixel field of said binary image data according to a value of the quantized data of a pixel being processed of said multivalued image data, the plural-pixel field corresponding to said pixel being processed, and includes controlling the order of arranging said dot-on pixels in said plural-pixel field according to a position on said dither threshold matrix corresponding to said pixel being processed (number and position of dots determined for each pixel by comparison of threshold values, whose positions within "sub-subparcels" 240 (Fig. 2) have been randomized, with a corresponding pixel value of the original image (column 5, lines 35-48 and 60-65)).

Regarding claim 36, Deschuytere et al. disclose an image-processing method for converting quantized data of multivalued image data into binary image data having a resolution higher than a resolution of said multivalued image data, the quantized data being obtained by quantizing said multivalued image data in multivalues by a random dither process using a plurality of quantization threshold values produced according to a dither threshold matrix, the image-processing method comprising: a dot-number-determining step of determining the number of dot-on pixels to be output in a plural-pixel field of said binary image data according to a value of the quantized data of a pixel being processed of said multivalued image data, the plural-pixel field corresponding to said pixel being processed (number of dots determined for each pixel by comparison of randomized threshold values with corresponding pixel value, as mentioned above); and a dot-output-position-determining step of controlling the order of arranging said number of said dot-on pixels in said plural-pixel field according to a position on said dither

threshold matrix corresponding to said pixel being processed (dot positions determined for each pixel on the basis of positions of randomized threshold values within "sub-subparcels" 240, as mentioned above).

Claim Rejections - 35 USC § 103

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deschuytere et al.

Regarding claim 22, Deschuytere et al., as mentioned above, disclose an image forming unit forming an image according to said binary image data. While an image-reading unit reading said multivalued image data by optically scanning a subject copy is not explicitly shown, it is well known in the art that images that are to be recorded are first scanned, after which the produced analog signals corresponding to the scanned image data are digitized for processing. The teaching of Deschuytere et al. inherently requires the scanning of an input image so that an output image corresponding to the scanned image may be recorded. Therefore, it would have been obvious for one of ordinary skill in the art to modify the teaching of Deschuytere et al. by providing an image-reading unit to input an image to be processed.

Regarding claims 23 and 24, Deschuytere et al. do not disclose a computer readable medium storing program code for causing a computer to process an image in the manner recited in above-rejected claims 1 and 17, respectively. However, it is well known in the art to provide software programs stored in a CD-ROM or the like, to a

computer, thereby enabling the computer to process image data according to the provided software. It would have been obvious for one of ordinary skill in the art to enable any type of image processing to be performed in software, so as to enable a user to perform the image-processing task on a computer without the need for specific processing hardware.

6. Claims 2, 3, 18, 26 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deschuytere et al. as applied to claims 1, 17, 25 and 36 above, and further in view of U.S. Patent 5,822,502 (Li et al.).

Deschuytere et al. do not disclose controlling the arrangement of the order of dot-on pixels or threshold values so as to form dots of a dot-concentration type, as recited in the above claims. However, Li et al. state that it is preferable to use dot-concentration (clustered dot) dithering with high and medium resolution image generating devices, because clustered dots at or near the middle of each screen element form round figures, which combine to produce visually pleasing images (column 1, lines 34-44). As Deschuytere et al. disclose the conversion of image data from low resolution to high resolution (mentioned above, note Fig. 3 of Deschuytere et al.), one of ordinary skill in the art, in view of Li et al., would have been motivated to arrange the randomized threshold values in Deschuytere et al. in such a way so that dots of the dot-concentration type are formed, thereby enhancing the quality of an output image recorded on a high resolution image generating device.

7. Claims 70-73 and 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Deschuytere et al. as applied to claims 1, 17, 23, 24 and 36 above, and further in

view of U.S. Patent 5,107,346 (Bowers et al.). Likewise, claim 74 is rejected under 35 U.S.C. 103(a) as being unpatentable over Deschuytere et al. in view of Li et al. as applied to claim 26 above, and further in view of Bowers et al.

Neither Deschuytere et al. nor Li et al. appear to disclose or suggest the random dither quantize unit or process comprising an error diffusion calculate unit for error diffusion calculation. Bowers et al. disclose a process that combines random dithering and error diffusion for reducing visibly discernible artifacts (Abstract). The threshold value used in the quantizing step may be randomly varied, thereby introducing further randomness into the error diffusion process (column 6, lines 61-68). Thus, combining random dithering and error diffusion processes removes discernible patterns (artifacts) in the output image (because of the random dithering (column 2, lines 31-41; column 6, lines 61-68)), while at the same time removing graininess in appearance (because of the error diffusion (column 1, lines 53-63)), thereby enhancing the overall quality of the output image. Therefore, it would have been obvious for one of ordinary skill in the art to have modified the combined teachings of Deschuytere et al. and Li et al., by combining the random dithering and error diffusion processes, as disclosed in Bowers et al.

Allowable Subject Matter

8. Claims 5-16, 19, 27-35, 38 and 65-69 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. The following is a statement of reasons for the indication of allowable subject matter: No prior art has been found to disclose or suggest the arrangement of threshold values in such a way that the difference between a fourth smallest threshold value and a fifth smallest threshold value in said dither threshold matrix is larger than a step width of said dither threshold matrix, as recited in claim 5; or wherein said dither threshold matrix comprises at least two basic dither threshold matrixes, the two basic dither threshold matrixes being joined in a main scanning direction at a position shifted in a sub-scanning direction, as recited in claim 6; or control of an amplitude of said quantization threshold values according to a characteristic amount output by an image characteristic extract unit, as recited in claims 7, 27 and 65-69; or supply of information indicating an edge field so that said dot output position determine unit arranges said dot-on pixels in a plural-pixel field of said binary image data according to a predetermined arranging order, the plural-pixel field corresponding to a pixel in the edge field of said multivalued image data, as recited in claims 19 and 38.

Response to Arguments

10. Applicant's arguments filed in response to the rejection of claims 1, 4, 17, 20, 21, 25 and 36 under 35 U.S.C. 102(e), and claims 2, 3, 18, 22-24, 26 and 37 under 35 U.S.C. 103(a), as set forth in the prior Office action mailed May 16, 2006, have been fully considered but they are not persuasive.

Applicant asserts that Deschuytere does not disclose or suggest a resolution convert binarize unit. Specifically, applicant states that Deschuytere "shows in Fig. 3 a coarse block 310 (memory store) and a fine block 320 (memory store), from which

those with ordinary skills in the art will recognize only that the memory store 310 receives from a raster image processor 304, organized as N by M rows and columns of pixel values. Deschuytere does not disclose or suggest the conversion of resolution. Consequently, Deschuytere does not disclose or suggest element (iv) of the claimed invention identified above." (see page 20 of current amendment).

Contrary to applicant's assertion, Deschuytere does disclose resolution conversion. The coarse block, as noted by applicant, is organized as N by M rows and columns of pixels values received from raster image processor 304. Noting Fig. 3, 7 x 5 pixels are stored in the coarse block. A pixel value P corresponding to a location stored in the coarse block is compared with a threshold value T at comparator 360, and the resulting binary value is stored in one of the pixel locations in fine block 320. The fine block consists of 14 x 10 pixels, as shown in Fig. 3. There are twice as many pixels corresponding to same image area in both rows and columns, and thus the image resolution has been effectively doubled in each direction. Therefore, it is apparent that Deschuytere discloses the conversion of resolution.

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thomas D. Lee whose telephone number is (571) 272-7436. The examiner can normally be reached on Monday-Friday, 7:30-5:00, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on (571) 272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Thomas D Lee
Primary Examiner
Technology Division 2625

tdl
November 16, 2006